

Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-8 (canceled).

1 9. (new) A method for examining an object comprising
2 at least two categories of materials in order to determine
3 a value of a physical parameter like thickness or mass of
4 each of said materials, the method comprising the steps of:
5 applying radiation through the object, the radiation
6 belonging to a broadband energy spectrum;
7 taking a plurality of measurements of the radiation
8 after having passed through the object, said
9 measurements being taken at respective energy
10 bands in said spectrum;
11 selecting a plurality of pairs of said energy bands;
12 defining, for each of said materials and each of said
13 pairs, a function of an intermediate parameter
14 (\hat{M}) based on the measurements in the energy
15 bands in the pair and on coefficients obtained in
16 a previous calibration, each of said intermediate
17 parameters being an estimation of the value of
18 the physical parameter for one of said materials,
19 and calculating values of said intermediate
20 parameters;
21 defining a weighted sum of said intermediate
22 parameters for each of said materials, the

23 intermediate parameters (\hat{M}) being weighted by
24 weighting coefficient;
25 calculating values of said weighting coefficients by
26 minimizing a variance of said weighted sum; and
27 calculating, for each of the materials, said value of
28 said physical parameter with the weighted sum
29 based on said values of said weighted
30 coefficients and said values of said intermediate
31 parameters.

1 10. (new) A method according to claim 9, wherein said
2 variance is minimized when a variation of a value of the
3 weighted sum is minimized according to variations of values
4 of said measurements.

1 11. (new) A method according to claim 10, wherein said
2 variations of values of said measurements are computed
3 according to a statistical law.

1 12. (new) A method according to claim 11, wherein said
2 statistical law entails variances of said measurements, and
3 said variance of said weighted sum is computed from said
4 variances of said measurements.

1 13. (new) A method according to claim 11, wherein said
2 statistical law is a Poisson law applied on a number of
3 photons of the radiation.

1 14. (new) A method according to claim 9, wherein said
2 pairs are equal in number to the number of said energy
3 bands less one.

1 15. (new) A method according to claim 14, wherein said
2 pairs each comprise the same energy band.

1 16. (new) A method according to claim 9, wherein said
2 functions of said intermediate parameters are polynomials.

1 17. (new) A method according to claim 16, wherein said
2 polynomials comprise one constant term, two linear terms of
3 said measurements, two quadratic terms of said
4 measurements, and one term proportional to both said
5 measurements.

1 18. (new) A method according to claim 9, wherein said
2 variance is computed with a covariance matrix expressing
3 derivatives of said intermediate parameters with respect to
4 said measurements.

1 19. (new) A method according to claim 9, wherein the
2 calibration is done with phantoms made of material having
3 known thicknesses and properties similar to the materials
4 of the object with respect to irradiation by said
5 radiation.

1 20. (new) A method according to claim 9, wherein said
2 materials are bone tissue and soft tissue.

3 21. (new) A method for examining an object comprising
4 at least two categories of materials in order to determine
5 a value of a physical parameter like thickness or mass of
6 each of said materials, the method comprising the steps of:

7 applying radiation through the object, the radiation
8 belonging to a broadband energy spectrum;
9 taking a plurality of measurements of the radiation
10 after having passed through the object, said
11 measurements being taken at respective energy
12 bands in said spectrum;
13 selecting a plurality of pairs of said energy bands,
14 wherein said pairs are equal in number to the
15 number of said energy bands less one, and wherein
16 each of pairs comprise the same energy band;
17 defining, for each of said materials and each of said
18 pairs, a function of an intermediate parameter
19 (\hat{M}) based on the measurements in the energy
20 bands in the pair and on coefficients obtained in
21 a previous calibration using phantoms made of
22 material having known thicknesses and properties
23 similar to the materials of the object with
24 respect to irradiation by said radiation, each of
25 said intermediate parameters being an estimation
26 of the value of the physical parameter for one of
27 said materials, and calculating values of said
28 intermediate parameters, wherein said functions
29 of said intermediate parameters are polynomials
30 comprising one constant term, two linear terms of
31 said measurements, two quadratic terms of said
32 measurements, and one term proportional to both
33 said measurements;
34 defining a weighted sum of said intermediate
35 parameters for each of said materials, the

36 intermediate parameters (\hat{M}) being weighted by
37 weighting coefficient;
38 calculating values of said weighting coefficients by
39 minimizing a variance of said weighted sum; and
40 calculating, for each of the materials, said value of
41 said physical parameter with the weighted sum
42 based on said values of said weighted
43 coefficients and said values of said intermediate
44 parameters.
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